

Fractions Math Manipulatives



Closing the Fractions Gap with Early Childhood Learners

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Mastering fraction standards can be a complex and daunting challenge for elementary school students. In many elementary school classrooms, teachers typically introduce fractions as “How many parts are shaded or not shaded?” Then, they begin to draw fraction number lines, rectangles and circles with shaded areas. For many students they initially struggle drawing parts in equal proportions when asked to create a visual representation. There are some students who need small group instruction and assistive technology, and in some instances, individual instruction is required to achieve mastery of the standard due to attention issues or a learning disability.



THE PURE
MATHEMATICIAN, LIKE
THE MUSICIAN, IS A
FREE CREATOR OF HIS
WORLD OF ORDERED
BEAUTY.

BERTRAND RUSSELL

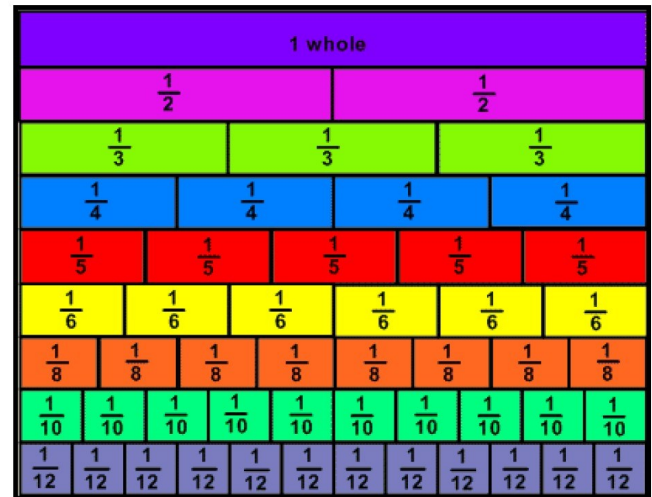
Phases of Teaching Fractions

In the next phase of teaching fractions, elementary teachers implement the strategy of fraction strips or blocks. These strategies allow students to collaborate with their peers and explore the fractions' concepts. Another benefit is the requirement for students to follow step-by-step directions to accurately draw or make visual representations. These strategies are effective to a certain point but can also bring problems. These problems make the standards of adding and subtracting fractions with the same denominators, different denominators, and mixed number even more difficult, but the skills must be mastered by the students.

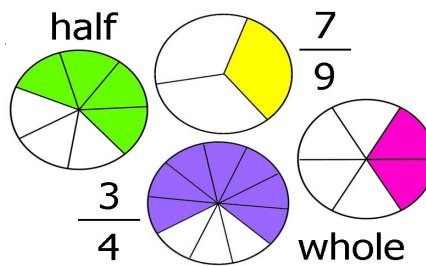
Strategies for Teaching Fractions in the Classroom

When teachers introduce finding the sum and difference of fractions, they usually begin by using common denominators. They often refer back to using the visual representation models that are posted on anchor charts or models that the students have created. The concepts of fraction exploration and collaboration among peers are

very effective in the understanding relationship between parts and whole quantities.



Teachers often use assessments, work samples, and classroom observations to determine whether or not students have mastered the ability to successfully draw visual representations of fractions. Due to time constraints, some teachers have students who need ex-



tended time, but they must move on to standards involving different denomi-

nators and mixed numbers. The strategy of finding common denominators can be quite confusing for students who exhibit poor math fact fluency and/or have a limited understanding of fractions smaller than $\frac{1}{4}$.

All of the strategies mentioned at this point have received success and must be used to help students gain a solid foundation to grasp the understanding of fractions. Teachers must consider the learning styles of all their students,

especially if they have learning and processing deficits. Students must eventually progress from the concrete visual representation to the abstract.

Article Link for Teaching Fractions:

<https://www.weareteachers.com/why-are-fractions-so-hard-to-teach-5-ways-to-help-students-even-high-schoolers-understand-them/>

All of the strategies mentioned at this point have received success and must be used to help students gain a solid foundation to grasp the understanding of fractions. Teachers must consider the learning styles of all their students, especially if they have learning and processing deficits. Students must eventually progress from the concrete visual representation to the abstract.

Teachers often use the following model to teach fractions:

Phase I

Visual Representation
by drawing parts/ whole,
number line, use of blocks,
and creating fraction strips

Phase 2

Find the sum and difference of
fractions with the same
denominators by using models
and anchor charts

Phase 3

Find the sum and difference of
ALL fractions with different
denominators and mixed
numbers

The most common obstacle for students in achieving mastery of fractions with different denominators and mixed numbers is in moving from Phase I and Phase II to Phase III. Over the years teachers have had very limited options to make this transition. Despite students' receive-

ing quality instruction in large and small group settings and using a variety of visual representations to learn fractions, many students begin to struggle at this time because they need a manipulative to bridge the gap. Most students understand the fractions of $\frac{1}{4}$, $\frac{1}{2}$, and $\frac{3}{4}$. However, they begin to

struggle when they are required to find the sum and difference of less common fractions with denominators of 3, 6, 8, 12, and 16. Because some students do not have a strong understanding of visual representations of common fractions, they lack the foundation to master increasingly difficult math standards that involve different denominators.

Slide-A-Round Math Manipulatives' Concept

By using a number line strategy, such as the Slide-A-Round Math Fractions 12th and 16^{ths} manipulatives, students are able to find the sum and difference of whole numbers without paper and pencil. These manipulatives eventually replace fraction strips and blocks be-

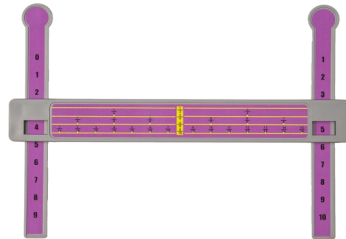
cause they are consistent, durable, and cost effective. Students are still encouraged to collaborate with their peers and continue their fraction exploration. Most importantly, when students use the manipulatives, they are able to find their answers and determining wheth-

er or not they are correct. As a result, teachers will have additional time to provide individual and small group instruction for struggling students; teachers will focus on teaching rather than reassuring students by validating correct answers.

Teaching Fractions with Slide-A-Round Manipulatives

Here is a common addition math problem that involves fractions:

$$4 \frac{1}{8} + \frac{3}{16} = \underline{\hspace{2cm}}$$



For a student to find the answer on the Fractions 16th manipulative, he must complete the following steps:

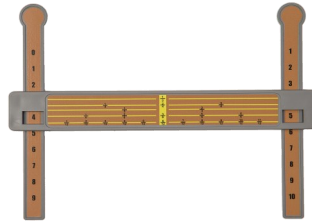
1. Establish the correct whole numbers in the manipulative's windows by having a 4 in the left window and 5 in the right window.
2. Find $\frac{1}{8}$. Note: The student will recognize that the fractions $\frac{1}{8}$ and $\frac{2}{16}$ are equivalent fractions.
3. "Drop down" to $\frac{2}{16}$ because the next part of the math problem has a denominator of 16
4. Move $\frac{3}{16}$ by counting to the right.

The final answer is $4 \frac{5}{16}$.

When student use the manipulatives, teachers will find that principle of great teaching is when students learn when they do not know they are being taught is evident. With these manipulatives students will continuously see the importance of the fraction $\frac{1}{2}$ and many of its equivalents because it is highlighted. They will recognize fractions that are greater and less than one-half and not all fractions can be simplified. Many students will realize through self-discovery that they can rank the manipulatives from least to greatest and greatest to least. With the Fractions 12ths manipulative, students will make the connection that the number on the manipulative are the same as the parts on their fraction strips.

Here is a common subtraction math problem that involves fractions:

$$4 \frac{2}{3} - \frac{2}{12} = \underline{\hspace{2cm}}$$



For a student to find the answer with the Fractions 12ths manipulative, he must complete the following steps:

1. Establish the correct whole numbers in the manipulative's windows by having a 4 in the left window and 5 in the right window.
2. Find $\frac{2}{3}$. Note: the student will recognize that the fractions $\frac{2}{3}$, $\frac{4}{6}$, and $\frac{8}{12}$ are equivalent fractions
3. “Drop down” to $\frac{8}{12}$ because the next part of the fraction has a denominator of 12
4. Move $\frac{2}{12}$ by counting to the left.

The unsimplified answer is $4 \frac{6}{12}$. The student will recognize $4 \frac{6}{12}$ can be simplified is $4 \frac{1}{2}$.

Slide-A-Round Manipulatives—Purpose and Model

The purpose of the new fractions manipulatives, which were created based on classroom experience and students' needs, is to **bridge the gap from visual representation to the abstract**. Here is a new model for teachers to follow when teaching fractions:

Phase I

Visual Representation
by drawing parts/ whole,
number line, use blocks,
and make fractions strips

Phase II

Find the sum and difference
of fractions with the same
denominators by using models
and anchor charts

Phase III

Use Slide-A-Round Math
Manipulatives to bridge
visual representation to
find sum and difference
of fractions and mixed num-
bers

Phase IV

Introduce finding denominators strategy with common fractions and use Slide-A-Round Manipulatives to check work.

Phase V

Introduce finding denominators strategy with uncommon fractions

By breaking down a difficult task into manageable parts, teachers can determine if their students require additional interventions and/ or need additional practice with a rubric. Teachers can provide their students the Five Phases of Fractions Rubric to monitor their progress; teachers also have the option to conference with the students on a weekly basis or daily basis if necessary. The rubric can also help the teacher group students for collaboration purposes.

Additionally, the rubric will increase students' accountability for their progress and assist them in asking more precise questions, especially students who have difficulty expressing themselves orally due to low tolerance of frustration, limited English proficiency, and/or speech impairment. As a result, instructional time will be more effective and efficient. Refer to the rubric on the following page.

**Elementary Fraction Standards:
M4N6. Students will further develop their understanding of the meaning of common fractions and use them in computations.**

1. Understand representations of simple equivalent fractions.
2. Add and subtract fractions and mixed numbers with common denominators. (Denominators should not exceed twelve.)
3. Convert and use mixed numbers and improper fractions interchangeably.

Teacher Cartoon #6404

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"To show you how well I understand fractions, I only did half of my homework."

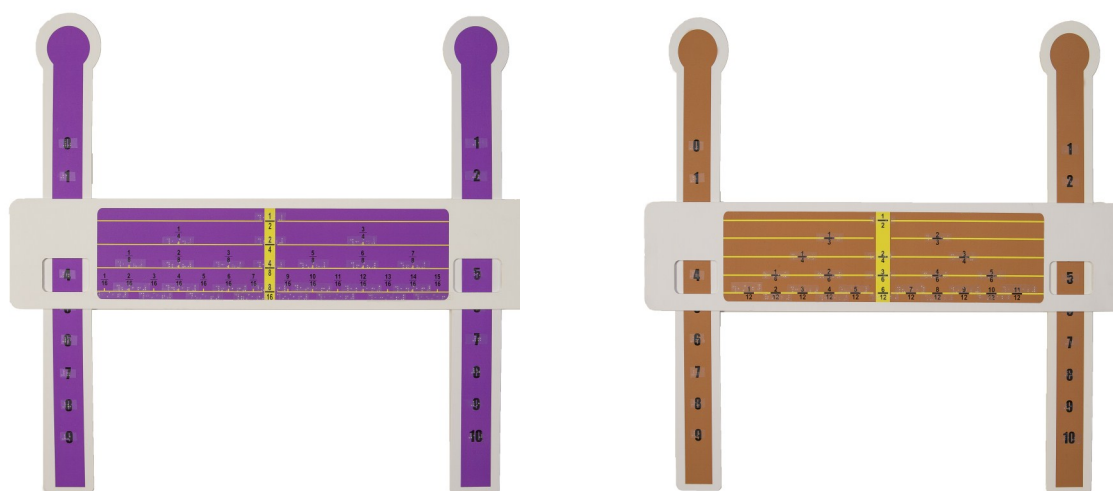
Math - Problem Solving : Fractions

Student Name: _____

Category					Date
Phase One	Demonstrates the ability to explain and independently draw visual representations of fractions (Initial level of mastery)	Demonstrates the ability to explain and independently draw visual representations of fractions (Emerging level of mastery)	Demonstrates the ability to explain and independently draw visual representations of fractions (Progressing level of mastery)	Demonstrates the ability to explain and independently draw visual representations of fractions (Mastery level)	
Phase Two	Demonstrates the ability to find the sum and/or difference of fractions with the same denominators (Initial level of mastery)	Demonstrates the ability to find the sum and/or difference of fractions with the same denominators (Emerging level of mastery)	Demonstrates the ability to find the sum and/or difference of fractions with the same denominators (Progressing level of mastery)	Demonstrates the ability to find the sum and/or difference of fractions with the same denominators (Mastery level)	
Phase Three	Demonstrates the ability to find the sum and/or difference of common fractions with different denominators with manipulative (Initial level of mastery)	Demonstrates the ability to find the sum and/or difference of common fractions with different denominators with manipulative (Emerging level of mastery)	Demonstrates the ability to find the sum and/or difference of common fractions with different denominators with manipulative (Progressing level of mastery)	Demonstrates the ability to find the sum and/or difference of common fractions with different denominators with manipulative (Mastery level)	
Phase Four	Demonstrates the ability to find the sum and/or difference of common fractions with different denominators without manipulative; Correctly uses manipulative to check work (Initial level of mastery)	Demonstrates the ability to find the sum and/or difference of common fractions with different denominators without manipulative; Correctly uses manipulative to check work (Emerging level of mastery)	Demonstrates the ability to find the sum and/or difference of common fractions with different denominators without manipulative; Correctly uses manipulative to check work (Progressing level of mastery)	Demonstrates the ability to find the sum and/or difference of common fractions with different denominators without manipulative; Correctly uses manipulative to check work (Mastery level)	
Phase Five	Demonstrates the ability to independently find sum and/or difference of uncommon fractions (Initial level of mastery)	Demonstrates the ability to independently find the sum and/or difference of uncommon fractions (Emerging level of mastery)	Demonstrates the ability to independently find the sum and/or difference of uncommon fractions (Progressing level of mastery)	Demonstrates the ability to independently find the sum and/or difference of uncommon fractions (Mastery level)	

It is important to note that Slide-A-Round Math Manipulatives has designed low vision and braille manipulatives that have received positive feedback from a variety of educational organizations. Students who have low vision or are blind have access to these manipulatives to learn fractions. Students with other

disabilities can have access to low-tech assistive technology to meet their grade- appropriate math standards on district, standard, and federal assessments as well as have their accommodations met, as stated in their Individualized Education Plans.



Article Summary and Background

Fractions are essential standards for students to master on classroom tests as well as on standardized assessments. Schools must focus on the short and long term since fractions are used in many everyday situations. By providing additional strategies and visual aids to support students' instruction in all academic settings, students are given opportunities to become more successful and less frustrated. Traditional methods of teaching fractions are

valid and must be implemented on a regular basis, but innovative strategies are necessary to reach all students.

I am Jim Franklin, a special education teacher from Rome, Georgia. I have taught for over 17 years in inclusion, resource, and self-contained settings. Based on the need of my students, I have invented several math manipulatives to address math standards for ALL students, including low vision

and blind students. I have delivered numerous trainings and demonstrations at school districts and national and state conferences throughout the United States.

For additional information and to watch a tutorial video in how to use the fractions manipulatives, an Easter Seals Indianapolis math demonstration video is posted on www.slidearoundmath.com.